US Army Corps of Engineers®
Engineer Research and Development Center

Hyperspectral Data Exploitation

Description

Provide algorithms and methodologies to extract Terrain Categorization (TERCAT) and Automatic Target Recognition (ATR) information from hyperspectral and multispectral imagery.

Capabilities

Provide day/night "Automated Analysis Tools" using spectral/spatial pattern analysis algorithms capable of interpreting spectra anywhere within visible (VIS) through long-wave thermal (LWIR) regions of the electromagnetic spectrum. Provide improved terrain classification performance with a factor of two reduction in misclassifications compared to typical multispectral methods. Provide improved false target discrimination with a factor of five improvement (using ROC analysis) over single band approaches for targets in the clear with light-to-moderate clutter. Some relevant sensors include HYDICE, NVIS, COMPASS, AVIRIS, HYMAP, Hyperion, LANDSAT, SEBASS, and SHARP.

Supporting Technology

Spectral/spatial algorithms are being implemented in C++ code. Standalone government-developed software (GOTS) is being developed with a data interface to industry standard commercial software (COTS). Plug-in modules to COTS (ERDAS, ENVI) are also being developed. Exploitation methodologies to extract TERCAT and ATR information from spectral imagery using the existing and newly-developed algorithms are being documented.

Benefits

TERCAT capabilities will improve awareness of the terrestrial battlespace environment. ATR capabilities will enhance target acquisition performance against difficult targets and isolate targets from clutter.

Success Stories

This effort prompted the fielding of a portable thermal imager used by tactical units in Afghanistan and Iraq. Wavelet-compressed data were successfully used with neural net classifiers & mixture algorithms for TERCAT. Genetic, PCA, & neural algorithms were successfully tested for TERCAT, as well as ICA algorithms for targeting (ATR). Two new sub-pixel algorithms [The Match Subspace Filter (MSF) and Mixture Tuned MSF (MTMSF)] were transitioned to an industry-standard COTS system.

Point of Contact

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